

Rangeland Soil Carbon Sequestration in the Chicago Climate Exchange

Joel R. Brown and Kellee James

International and domestic efforts to reduce greenhouse gas (GHG) levels in the atmosphere have generated widespread interest in activities that can extract carbon (C) from the atmosphere and store it in relatively permanent sinks. The movement of C from the atmosphere and subsequent storage in the soil and vegetation (sequestration) is a potentially important contribution that agriculture and forestry can make to mitigate one of the drivers of global climate change. Fixing atmospheric C into more stable soil compounds via naturally occurring processes (photosynthesis, humification and aggregation) is relatively well understood by scientists and land managers, but the widespread application of these practices as a key element in a national and global GHG level reduction effort has yet to be universally accepted.

C storage in terrestrial sinks is attractive in that 1) results can be achieved quickly 2) technologies for enhanced sequestration can be implemented without major economic impact and are generally associated with improved management of resources and more efficient production systems and 3) delivery infrastructure (university extension, conservation programs) are in place and proven successful. Incentives intended to motivate private landowners to adopt practices that provide a nonspecific societal benefit have originated in public sector. However, there is substantial interest in using private sector markets to improve efficiency and reduce costs. The market for terrestrial projects is only now emerging and all participants are learning. The Chicago Climate Exchange (CCX) has been a leader in developing new GHG markets and recently embarked on a path intended to facilitate offset projects on North American rangelands.

Rangelands (land with an intact natural vegetation of grasses or shrubs) cover about 160 m ha (>20% of private land) in the U.S. Although potential for increased carbon storage on rangelands exceeds 360 M T CO₂e/y (Follett et al. 2001), barriers to widespread implementation of rangeland-based projects include low inherent productivity, high spatiotemporal variability, diverse ownership and lack of cost effective prediction, measurement and verification tools. Potential increases in C sequestration are largely a function of biomass production, which responds most closely to precipitation inputs. This lack of reliable precipitation reduces the ability of producers to reliably use nutrient additions to enhance productivity. In addition, spatial variability attributable to differences in soils and topography make the prediction of response to inputs difficult. Rangelands owners have many land management objectives and it is unlikely that C sequestration will be the primary management objective without a financial incentive to do so. Adopting these sequestration activities within a market structure effectively puts a price on the specified practices, allowing the owner to perform a cost-benefit analysis and base management decisions on the best available information. Accounting for, rather than overcoming, these constraints is a critical component of constructing a framework that will support viable rangeland sequestration projects in a private sector market.

To address these challenges, CCX is collaborating with USDA to establish procedures that will result in credible estimates of rangeland carbon fluxes that could serve as a basis for crediting rates within CCX. An expert panel used existing information to group rangelands according to Land Resource Region (LRR). Within each LRR, the panel surveyed existing literature, model outputs and publicly available information (i.e. precipitation, soil and vegetation) to determine an average rate of carbon sequestration. Two rates were developed: one for intact rangelands on which management is changed to increase C and one for restoring degraded rangelands. The practices to achieve these management changes are quantifiable, verifiable and widely proven to enhance net primary productivity (a surrogate for carbon flux). The result of these efforts is a protocol that is accurate and cost effective.

Carbon sequestration on rangeland is affected by climate and land management practices. In the more humid tallgrass prairie, sequestration rates can approach 500 kg/ha/y² through the application of management practices that enhance biomass production. At the arid extreme, rangeland C sequestration may be <10 kg/ha/y, even though management practices are similar. In addition, annual fluxes typically exceed 10% of the soil C pool. Management practices, typically the adjustment of livestock stocking rates and seasonal grazing, are difficult to detect and verify.

Although there has been substantial interest in delivering terrestrial C sequestration to the private sector market, a lack of certainty has slowed progress. Lack of certainty in terms of potential gains, risk of loss due to climatic variability and management changes and administrative arrangements to reduce transaction costs in land-based systems are all issues that must be resolved if private sector markets are to be a driving force in increasing C storage in terrestrial systems. A key element in reducing the inherent risks associated with rangeland management will be the role of aggregators.

Once risks, uncertainties, or other barriers to entry are recognized, market mechanisms can be ideally suited to addressing these difficulties. Beginning with strong scientific and technical support as described previously, the market structure is key to providing standardized rules, thus allowing participants to make economic assessments on the feasibility of getting involved. In the case of CCX, the Exchange provides the rules, crediting and measurement protocol, but the implementation and enrollment of ranch owners as market participants is undertaken by a category of market participant known as Aggregators.

A CCX-approved Aggregator is a legally-recognized entity that does not own carbon offset projects itself, but instead represents CCX-registered projects owned by individual project-owners such as ranchers or small farmers. Aggregators perform the following duties (CCX Rulebook, 2006):

- (1) accept initial registration forms from owners of CCX-eligible Projects;
- (2) assemble Project Reports from Project Owners, retain copies of Project verification records;
- (3) submit Offset registration fees to CCX;

- (4) have sole authority to access the Registry Account(s) holding the Offsets issued to Projects it represents and to access the CCX Trading Platform as an Authorized Trader; and,
- (5) execute sales on the CCX Trading Platform on behalf of Project Owners and distribute sales proceeds to Project Owners in accordance with the terms agreed between the Aggregator and Project Owners.

Aggregators are important in addressing, at the project level, the uncertainties that come with implementation and monitoring of the management practices that lead to higher levels of carbon sequestration. Compliance with practices such as moderate stocking rates, rotational grazing and seasonal use is ensured through regular (usually annual, in the case of range projects) in-field checks conducted by CCX-approved verifiers. Verifier visits are generally managed by the Aggregator and allow for sampling of total enrolled acreage, rather than the on-site verification of each enrolled acre. Not only does the Aggregator play a part in ensuring the adoption and continued use of specified practices, a second economic goal of lowered transaction costs is met. Aggregators reduce transaction costs for the project owner through economies of scale by bundling multiple projects together and registering them on the Exchange. This allows the cost of participation, including verification and monitoring to be spread across dozens or even hundreds of projects. Because the Aggregators themselves must meet certain requirements and abide by the rules of the Exchange in order to remain eligible to participate, market integrity is maintained at the lowest cost. Finally, Aggregators provide vital information about the emerging market for carbon offsets to their constituents. Markets rely on attracting enough participants to become liquid. Therefore, Aggregators play a role in enhancing the depth and viability of a market by efficiently reaching large numbers of eligible project-owners.

From inception, Chicago Climate Exchange has found the inclusion of Aggregators to be an extremely effective model in developing participation in the carbon market from the agricultural sector. The need for Aggregators has increased entrepreneurial activity in the carbon markets. In some cases, established membership organizations and cooperatives have created new departments in order to offer this additional category of service to their members. Other times, new companies have been created to aggregate projects, with the primary mission one of marketing these “environmental services”. This increase in competition is a benefit to both the market in general, and project/land owners specifically. Individual aggregator success and contribution will be determined by how well they can integrate existing publicly available information from sources such as NRCS Field and State Offices, local university and extension agents, management consultants and ranchers to develop credible estimates of soil carbon change. In addition, the monitoring and verification requirements will require creativity and a thorough knowledge of local conditions and management practices as well as the state of the science. This approach truly represents an opportunity to address national and global concerns about climate change with public/private partnerships.

Literature Cited

Chicago Climate Exchange. 2006. CCX Rulebook.
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